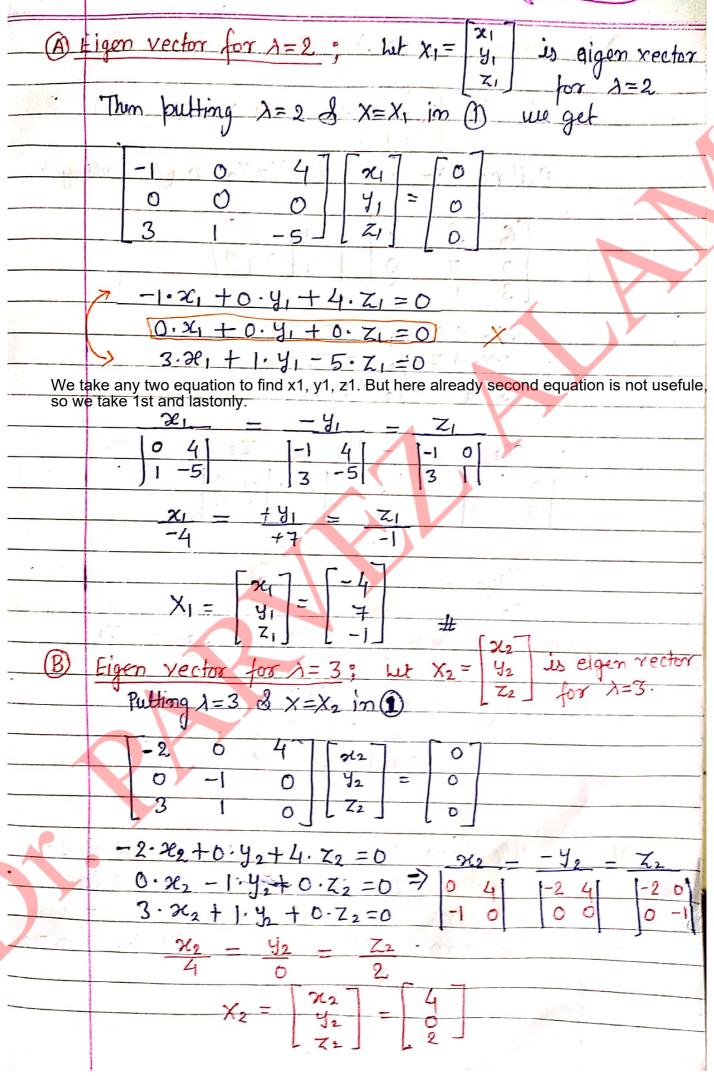
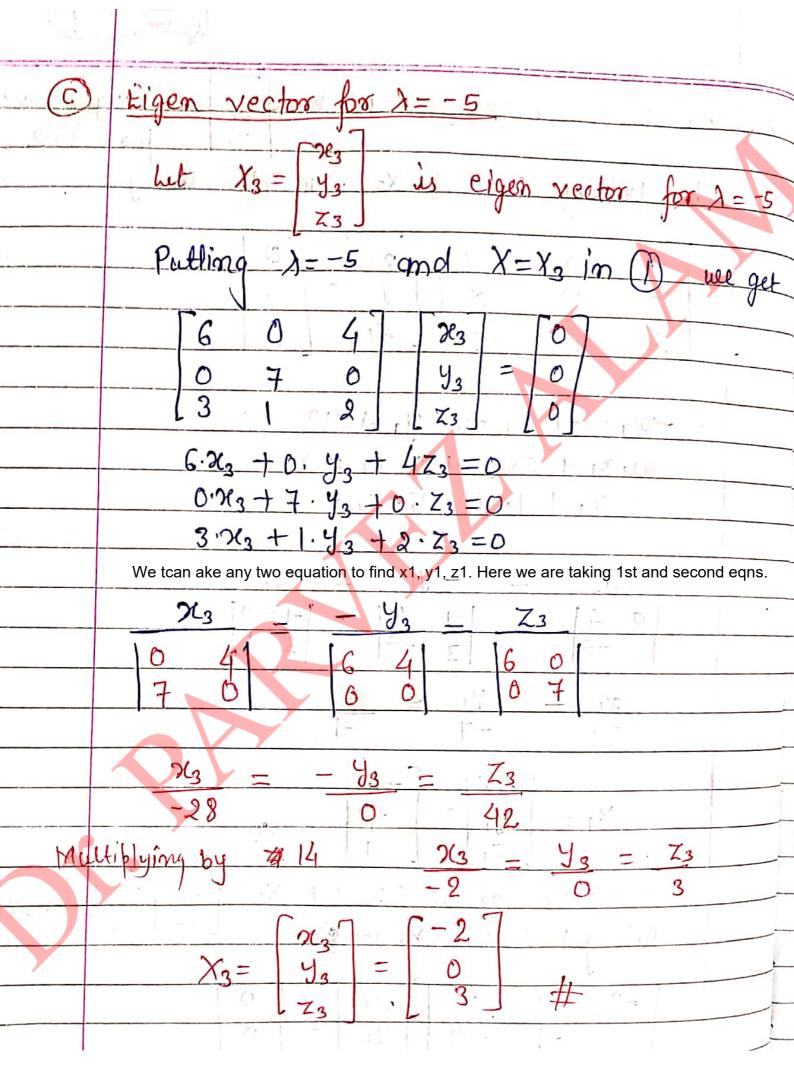


\						
(A)	Eigen values and Eigen vectors of a square matrix:					
	Let Abe a square matrix of order n, then a					
hon	1-Zera column matrix X is said to be river					
180	vector of matrix A, If it satisfy the equation					
- Par 1	$\frac{AX = \lambda X}{OY  (A - \lambda I) X = 0}; \text{ while } \lambda \text{ is any real}$					
1 2 2 2 2	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$					
	Here, A is called Figen value of the matrix.A.					
Not	te :- Eigen values are also called characteristice roots					
17 ( - )	and latent values.					
1	ELO _ 0 = 0 = 18 A 80 = 0 = 25 - 26 1 + 30 = 0 = 19 A 430 = 0 = 19 A 430 = 0					
H-351 2	Fed 1 0 0 = 08 + KO 1 26 < 1 - 7 - 7 - 7 13 13 13 13 13 6					
(*)	Characteristic Equation 3-					
	The chanacteristic equation of matrix A of order					
	1) is alfined by					
18 00	$ A-\lambda I =0$					
	And this equation gives not order polynomial in A					
	mal mal					
101-1017	an 2n + an + 2n + + an + an = 0 mail					
	the state of the s					
Nata						
Note:	Dif A is see square matrix af order n, then it will have n eigen values and n eigen vectors.					
R	will have n eigen values and n eigen vectors.					
ASSEN.	(a) Al A : 1 miles of them ite					
7	(2) If A is square matrix of porder 3, then its Characteristic eqn. is given by					
	STIGITUTE TITLE COM. AS GIVEN BY					
	13- (Trace of A) 12+ (sum of digonal minors) 1- 1A1=0					
4	THE PROPERTY OF A CONTRACT OF THE PROPERTY OF					
	3 Trace of A = Sum of diagonal elements of A.					
	(4). For $2x2$ matrix $\lambda^2 - (\text{Trace of A})\lambda +  A  = 0$					

6	Note: 1. Sum of all Eigen Values=Trace=Sum of diagonal elements.  2. DetA= A =Multiplication of all Eigen Values.  You can verify above to points in your questions				
Question (		eigen Yalves one		rector's af	
		TT 0 4	1		
D 1994	de de las	$A = 0 \ 2 \ 0$ $3 \ 1 \ -3$	1. 3	A de l	
1991	ed of him	Del 3 inings	mmile	El Cara	
<u>Mo2</u>	15'	ristic eqn. of A $A - \lambda I = 0$	is -egn.	is given by	
SINGE UN	ci e antin	71 - VT   = 0		Raugh	
· one x	1dm 1 72 1-	λ 0 0x (x - 4	Ya	Trace= 1+2-3=0	
		$2-\lambda$ 0	= 0	1A1 = -30	
· · Coris	non 11 h	Solor Hasir -3+1		e anoll	
	determinant 6	R By formula		0 4	
(1-7) [(2-7)	(-3-2)] hall	$\lambda^3$ - (Trace) $\lambda^2$ +	white an	3- 13	
∪n. ⊨qn	74[0-3(2-2)]=0	(Sim aldiggonal m	1	0 01 = 9-0 = 9	
⇒ - Y3 +1	9X - 30 =0	$\Rightarrow \lambda^3 - 0 - 19\lambda + 1$	30 = 0	02=-6-0=-6	
$\Rightarrow (2-\lambda)(\lambda)$	45) (1-3) = 0	$\Rightarrow \lambda^3 - 19\lambda + 3$	0 = 0	D3 =-3-12=-15	
$\Rightarrow \lambda = 2$	, - 5	=) (2-3) anitaun	enletic li	DI+D2+P3=-19	
are eigen	ralves a A.	=) iby calcilion	to mar da	fo 03	
V U	0 1	1= 2,3,-5	mitch vi	$\downarrow D_2 = \begin{vmatrix} 1 & 4 \end{vmatrix}$ .	
<u>y</u> -	Gr=	I /ane /eligen va	ues	$\begin{bmatrix} 3 & -3 \end{bmatrix}$	
And Inst	million belong	Hine awes - Th	nuss and	1-1-1	
				J.	
The	igen xectors	for $\lambda = 2,3,-$	5 con k	ne calculated	
by	egn.	$(A - \lambda I) X =$	0		
1	, ,		<b>—</b>	where	
well.	11-2	Fabruary British	4 5 7 6	$0     \chi = \frac{x}{2}$	
1 2 - 4 - 4 - 4 - 9 - 4 - 9 - 4 - 9 - 4 - 9 - 4 - 9 - 4 - 9 - 9	3		Z	O   21	
W	Il to come in	vident mounts	ı — (	1) rector	
71: (1)	11 3 3 3 7 1 1			1.	

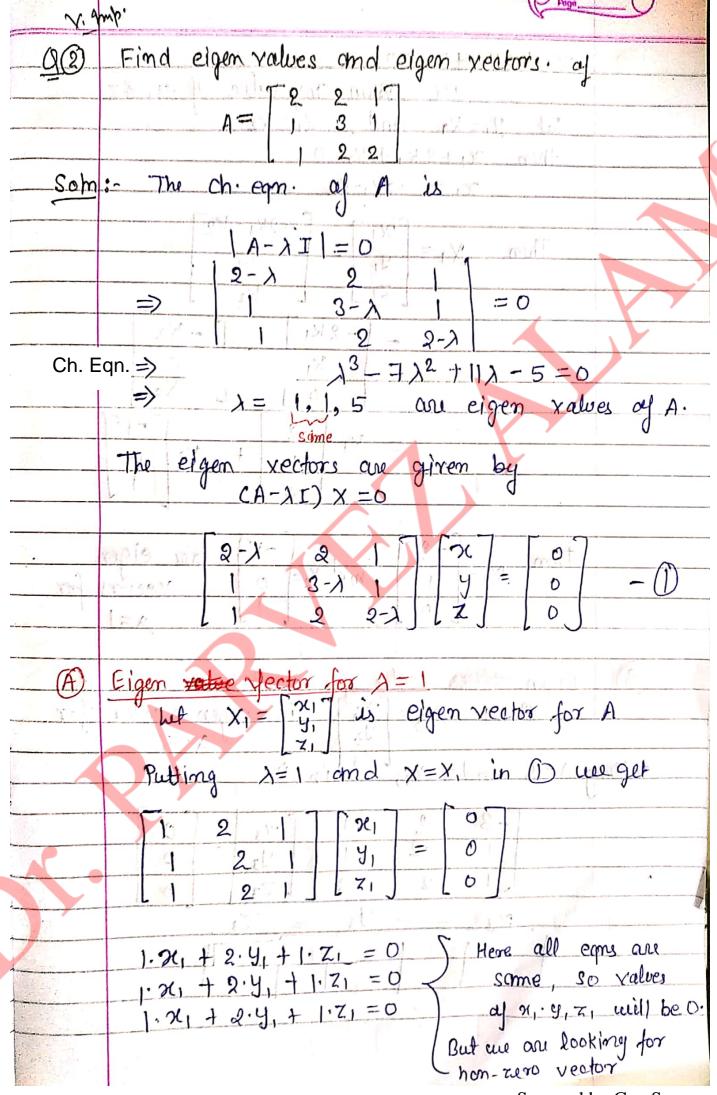




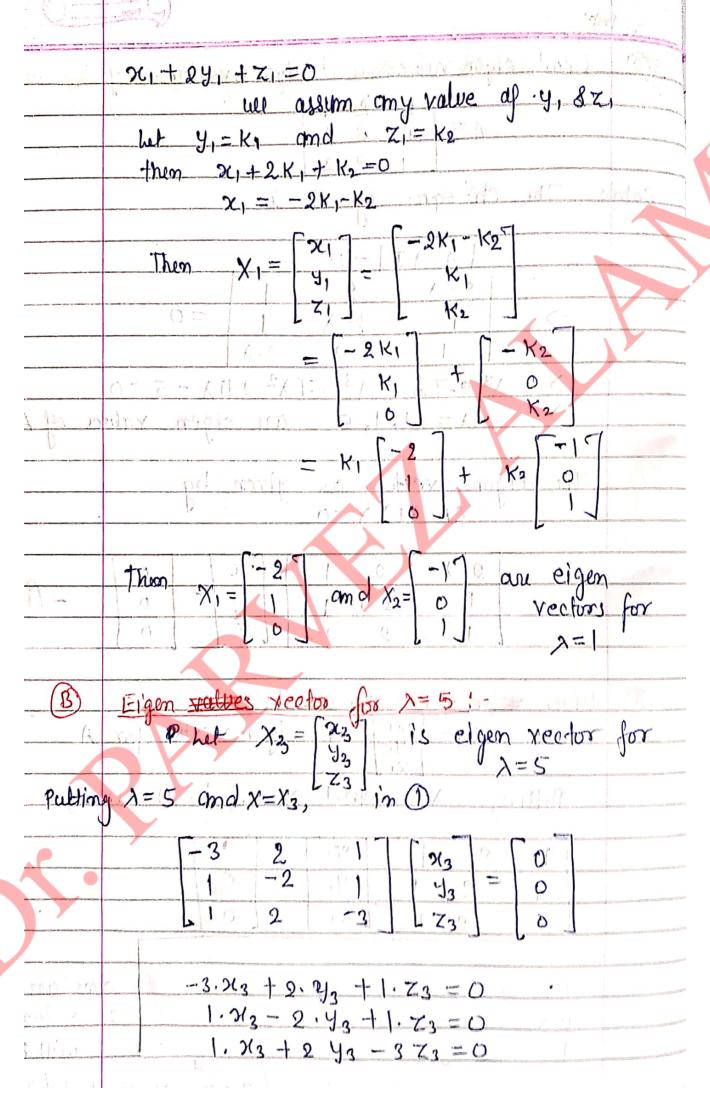
Note: 1) We have to use any two equations to find x. y & z, kg but we should select two egas s.t. all valles of x y z nat be zero. Afteast one should be non-zero

If all equations are the same or if we are getting x=0, y=0, z=0 for all pairs of equations, then we assume any two variables and then calculate third variable (for 3x3 matrix).

e.g. x1=k1 and y1=k2



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We tcan ake any two equation to find x1, y1, z1. Here we are taking 1st and second eqns.

$$\frac{3X_{3}}{4} = \frac{4}{4}$$

$$\frac{3X_{3}}{4} = \frac{7}{4}$$

$$\frac{3X_{3}}{4} = \frac{7}{4}$$

$$X_3 = \begin{bmatrix} \chi_3 \\ y_3 \\ \chi_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

## **Exercise:**

Q1: Find the eigen values and eigen vectors of the following matrices

(i) 
$$A = \begin{bmatrix} 7 & -2 & 2 \\ -2 & 1 & 4 \\ -2 & 4 & 1 \end{bmatrix}$$
 (ii)  $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ 

(iii)  $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -1 & 2 \end{bmatrix}$  (iv)  $A = \begin{bmatrix} 3 & 7 & 0 \\ -1 & 2 & -1 \\ 3 & -1 & 0 \\ -1 & 3 & -1 & 3 \end{bmatrix}$ 

Q2: Find the Eigen values, corresponding Eigen vectors, and Eigen spaces of the following matrices.

1) 
$$A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$$
 4)  $A = \begin{bmatrix} 3 & -3 & 2 \\ -1 & 5 & -2 \\ -1 & 3 & 0 \end{bmatrix}$ 

2) 
$$A = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$
 5)  $A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$ 

3) 
$$A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$$